STATUS OF CLAIMS

1. (currently amended) A vibration motor, comprising:

a cover plate;

a casing coupled to said cover plate and providing an internal space with said cover plate;

a shaft coupled between central portions of said cover plate and said casing;

a first printed circuit board (PCB) mounted on said cover plate;

a magnet mounted on said cover plate and disposed around sad first PCB;

a second PCB rotatably supported by said shaft and provided with a commutator having a plurality of segments at a bottom of said second PCB;

an insulator mounting coils coupled to said commutator to said second PCB; and

a pair of brushes having one end coupled to said first PCB and the other end extended from said one end toward said commutator ~~at~~ and along a first ~~bending~~ line, the first lines of the brushes converging, said the other end having a curved bending portion extended from said the other end and having a contact line ~~parallel~~ substantially perpendicular to said ~~bending~~ first line to be in line contact with said commutator.

2. (original) The vibration motor of claim 1, with said brush comprising:

a first extension extended from said one end along said first PCB;

a second extension upwardly extended from said first extension at said bending line toward said commutator, said second extension spaced-apart from said first PCB and said commutator; and

said curved bending portion extended from said second extension to be bent with a width line parallel to said commutator and said bending line.

3. (currently amended) A vibration motor, comprising:

a cover plate;

a casing coupled to said cover plate and providing an internal space with said cover plate;

a shaft coupled between central portions of said cover plate and said casing;

a first printed circuit board (PCB) mounted on said cover plate;

a magnet mounted on said cover plate and disposed around sad first PCB;

a second PCB rotatably supported by said shaft and provided with a commutator having a plurality of segments at a bottom of said second PCB;

an insulator mounting coils coupled to said commutator to said second PCB; and

a pair of brushes having one end coupled to said first PCB and the other end extended from said one end toward said commutator at a bending line, the one end of both brushes being on the

same side of the shaft and the shaft being between the brushes, said the other end having a portion parallel in ~~to~~ said commutator to be line contact with said commutator.

4. (currently amended) The vibration motor of claim 3, with said brush comprising:

a first extension extended from said one end along said first PCB;

a second extension upwardly extended from said first extension at a bending line toward said commutator, said second extension spaced-apart from said first PCB and said commutator; and

a curved bending portion extended from said second extension and bent with a width line parallel to said commutator and said bending line, ~~sad~~ said curved bending portion being in line contact with said commutator.

5. (withdrawn) A motor, comprising:

an outer case containing a stator and a rotor, said stator fixed on said casing and having a shaft, said rotor disposed around said shaft to rotate about said shaft, said rotor having a commutator;

a brush having a first end fixedly electrically coupled to said stator and a second end upwardly extended toward said rotor; and

a curved bending portion formed on said second end of said brush and having a contact line parallel to said commutator ~~to be~~ electrically in contact with said commutator.

6. (withdrawn) The motor of claim 5, with said curved bending portion having a plurality of full width lines formed when said curved bending portion is cut by any plane parallel to said commutator, said full width lines being parallel to said contact lines.

7. (withdrawn) The motor of claim 5, with said brush having a flat plate between said curved bending portion and said first end.

8. (withdrawn) The motor of claim 5, with said brush having a first extension extended from said first end along said stator in a direction parallel to a center line of said shaft, a second extension upwardly extended from said first extension at a bending line disposed between said first extension and said second extension, said contact line being parallel to said bending line.

9. (withdrawn) The motor of claim 8, with said curved bending portion having a plurality of full width lines formed when said curved bending portion is cut by any plane parallel to said commutator, said full width lines being parallel to either one of said bending line and said contact lines.

10. (withdrawn) The motor of claim 8, with said second extension having a flat plate being parallel to said commutator.

11. (withdrawn) The motor of claim 5, with said curved bending portion being a curved plate curved around said shaft while said contact line of said curved bending portion is perpendicular to said shaft.

12. (withdrawn) The motor of claim 5, with said curved bending portion being a curved plate curved while any line formed when a plane parallel to said commutator meets said curved bending portion is parallel to said contact line of said curved bending portion.

13. (withdrawn) The motor of claim 5, with said contact line of said curved bending portion formed in a radial direction of said shaft.

14. (withdrawn) The motor of claim 5, with said curved bending portion having the same curvature as said commutator where said curved bending portion is contact with said commutator.

15. (currently amended) A motor, comprising:

an outer case containing a stator and a rotor, said stator fixed on said casing and having a shaft, said rotor disposed around said shaft to rotate about said shaft, said rotor having a commutator;

a brush having a first end fixedly electrically coupled to said stator and a second end upwardly extended toward said rotor; and

a curved bending portion, curving around the shaft and formed on said second end of said brush and having a contact line parallel to said commutator to be electrically in contact with said commutator;

said outer case having a cover plate and a casing coupled to said cover plate and providing an internal space with said cover plate;

said shaft coupled between central portions of said cover plate and said casing;

a first printed circuit board (PCB) mounted on said cover plate;

a magnet mounted on said cover plate and disposed around sad first PCB;

a second PCB spaced-apart from said first PCB, rotatably supported by said shaft, and provided with coils and said commutator coupled to said coils at a bottom of said second PCB;

an insulator mounting said coils to said second PCB; and

said brush fixed on said first PCB and extended toward said commutator of said rotor.

16. (withdrawn) A motor, comprising:

an outer case containing a stator and a stator, said stator fixed on said casing and having a shaft, said rotor disposed around said shaft to rotate about said shaft, said rotor having a commutator;

a pair of brushes each having a first end fixedly electrically coupled to said stator and a second end upwardly extended toward said rotor; and

a curved bending portion formed on said second end of each of said brushes and having a contact line parallel to said commutator to be electrically contact with said commutator.

17. (withdrawn) The motor of claim 16, with said contact line being the full width of said curved bending portion in a radial direction of said shaft.

18. (withdrawn) The motor of claim 16, with said brushes disposed around said shaft opposite to each other while said contact line of said curved bending portion is perpendicular to a tangential line of a curved portion of said commutator where said commutator contacts said curved bending portion.

19. (withdrawn) The motor of claim 16, with said curved bending portion being a curved plate curved around said shaft while said contact line of said curved bending portion is perpendicular to said shaft.

20. (withdrawn) The motor of claim 16, with said curved bending portion being a curved plate curved while any line formed when a plane parallel to said commutator meets said curved bending portion is parallel to said contact line of said curved bending portion.

REMARKS

This patent application presently includes claims 1-20, of which claims 5-14 and 16-20 were withdrawn from further consideration, claims 1-4 are rejected, and claim 15 is objected to as being in improper dependent form. Claims 1 and 3 are amended to define the invention more clearly, claim 4 is amended to correct inadvertent errors, and claim 15 is rewritten in independent, amended form.

Claim 15 was objected to as being in improper independent form. This claim is now rewritten in independent, amended form. The amendment involved inserting "curving around the shaft and then" after "portion" at line 7. This was done to clarify that the brush is not a straight brush as shown in the Aoki patent, but one which curves around the shaft as seen, for example, in Figure 2. This will be discussed further below. Inasmuch as claim 15 is now an independent claim, the objection thereto should be withdrawn.

Claims 1-4 were rejected as obvious over Aoki in view of Yamaguchi et al. This rejection is respectfully traversed. Neither reference, nor the combination thereof renders the present claims obvious.

As explained at page 5, lines 4-16, the problem encountered when brushes are utilized that curve around the shaft is that they tend to have non-uniform, point contact with the commutator. In accordance with the present invention, the brushes are in line contact with the commutator which is more uniform and avoids the type of current fluctuations illustrated in Figure 7 (see Fig. 19). There is not the slightest suggestion in either of the cited references of the point contact problem or that it could be alleviated by creating line contact between the brushes and the commutator. Accordingly, this feature, alone, distinguishes patentably over the cited references or their combination.

In addition, claim 1 provides that the brushes extend from their securement end toward the commutator along a first line with the first lines of the brushes converging. In addition, the

contact line of a brush is substantially perpendicular to the first line. This defines one way in which the line contact may be achieved. This feature is also not taught or suggested by either reference or their combination and therefore provides an additional ground for the allowability of claim 1.

Some explanation is believed to be appropriate with respect to the language in claim 1. The description of Fig. 10 appearing at page 12, lines 6-16 refers to a bending line a1 which is generally perpendicular to the brush portion 12a. The bending line a1 is described at lines 11-12 as being neither perpendicular to nor parallel to a central line C. It will be appreciated that portion 12a which is generally perpendicular to the line a1 would therefore not be parallel to the central line C and that the two portions 12a must converge. This is the basis for the language in claim 1 regarding the first lines. It is also stated at page 13, lines 14-15 that the bending angle of line a1 is equal to the angle of line contact a2. It will be appreciated that lines a1 and lines a2 must therefore be parallel. Since the brush portion 12a is substantially perpendicular to line a1, it will be appreciated that it is also substantially perpendicular to line contact a2. This is the basis for the substantially perpendicular language introduced into claim 1.

Claim 3 now recites that the one end of both brushes is on the same side of the shaft and the shaft is between the brushes. This was intended to distinguish the structure of Aoki where the fixation ends of the two brushes are on opposite sides of the shaft. The brush point contact problem discussed above does not occur with the parallel types of brushes shown in Aoki which are automatically in line contact with the commutator. However, this is not the case with the curve-type brushes of the present invention and Yamaguchi. As explained above, the curved brushes of the prior art exhibit the point contact problem, whereas the present invention achieves line contact with the commutator. This feature is specifically claimed in the last line of claim 3. Accordingly, claim 3 distinguishes patentably over the cited references or their combination and should be allowed.

Claim 4 depends from claim 3 and is believed to be allowable based upon it dependence from an allowable claim.

It should be noted that two amendments have been made at line 10 of claim 4. One corrected a misspelling of the word "said" and the second an inadvertent omission of the word "in" after "being."

Claim 15 was amended at line 7 to recite that the curved bending portion curves around the shaft. This was intended to make it clear that the motor being claimed was the type having a curved brush, not the straight brush of Aoki. As explained above, the point contact problem does not occur with straight brushes, but with curved brushes. Moreover, the Applicants avoided this problem by providing a brush having a contact line as claimed at line 8 and illustrated, for example, in Fig. 12 (compare this to Fig. 5). This contact line is parallel to the commutator and overcomes the point contact problem. This feature is not taught or suggested by either cited reference or the combination thereof. Accordingly, claim 15 should now be allowable.

Applicants' attorney has made every effort to place this patent application in condition for allowance. It is therefore earnestly requested that this patent application, as a whole, receive favorable reconsideration and that all of the claims be allowed as presently constituted. Should there remain any unanswered questions, the Examiner is requested to call the Applicants' undersigned attorney at the telephone number indicated below.

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Respectfully submitted,

By _____

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